SOLAR OBSERVATIONS

SOLAR AND SKY RADIATION MEASUREMENTS DURING JANUARY, 1927

By HERBERT H. KIMBALL, Solar Radiation Investigations

For a description of instruments and exposures and an account of the method of obtaining and reducing measurements the reader is referred to the REVIEW for January, 1924, **52**: 42, January, 1925, **53**: 39, and July, 1925, **53**: 318.

Commencing with this month, weekly summaries are given in Table 2 of the total radiation received on a horizontal surface from the sun and sky at the Bureau of Entomology station, Twin Falls, Idaho, latitude 42° 29′ N., longitude 114° 25′ W., altitude 1,300 meters. The measurements are obtained by the use of a Weather Bureau recording thermoelectric pyrheliometer under the supervision of the Bureau of Entomology.

From Table 1 it is seen that solar radiation intensities averaged slightly below normal at all three stations. At Washington, D. C., at noon of the 27th, however, a measured intensity of 1.45 gr. cal. per minute per cm^2 exceeds the previous noon maximum for January by about 1 per cent.

TABLE 1.—*Solar radiation intensities during January, 1927*

[Gram-calories per minute per square centimeter of normal surface]

Washington, D. C.

Date	Sun's zenith distance										
	8 a.m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon
	75th mer. time	Air mass									Local mean solar time
		A. M.					P. M.				
	e.	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e.
	mm.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
Jan. 6	2.74	0.87	0.98	1.18	1.35	1.54	------	------	------	------	2.62
11	1.60	0.64	0.82	1.03	1.22	1.45	------	0.85	0.62	------	1.45
12	1.78	0.37	0.47	0.69	0.99	------	------	------	------	------	1.88
25	3.30	0.64	0.78	0.99	1.21	------	1.28	1.02	0.86	0.76	3.15
27	0.81	------	1.07	1.20	1.42	1.62	1.31	------	------	------	1.12
31	3.81	------	1.02	------	------	------	------	------	------	------	3.99
Means	------	**0.63**	**0.86**	**1.02**	**1.24**	**1.54**	(1.30)	(0.94)	(0.74)	(0.76)	------
Departures	------	**−0.10**	**+0.02**	**+0.02**	**+0.01**	------	+0.07	−0.09	−0.13	−0.02	------
Madison, Wis.											
Jan. 5	3.15	0.99	------	------	------	------	------	------	------	------	3.30
6	1.88	------	------	------	------	------	------	1.26	------	------	2.06
14	0.81	------	------	------	------	------	------	1.28	------	------	0.74
20	0.81	0.86	0.96	1.09	------	------	------	1.00	------	------	1.19
24	1.68	0.93	1.05	1.20	------	------	------	------	------	------	2.06
25	1.78	0.79	0.91	1.07	1.21	------	------	------	------	------	1.68
26	0.41	1.03	1.15	1.26	------	------	------	------	------	------	0.74
30	2.49	------	------	------	1.41	------	------	------	------	------	2.16
31	1.88	0.89	------	------	------	------	------	------	------	------	2.16
Means	------	**0.92**	**1.02**	**1.16**	(1.31)	------	------	1.18	------	------	------
Departures	------	**−0.04**	**−0.06**	**−0.07**	**−0.04**	------	------	**−0.04**	------	------	------
Lincoln, Nebr.											
Jan. 4	3.15	------	1.17	1.28	------	1.48	------	1.25	1.17	1.06	4.17
5	3.45	0.90	1.00	------	------	------	------	------	1.04	0.93	4.57
6	3.45	0.84	0.95	1.10	------	------	------	1.15	------	------	3.90
8	3.81	0.84	1.09	1.25	------	------	------	1.19	1.08	0.94	4.17
10	2.06	1.05	1.16	1.24	------	------	------	------	------	------	2.62
13	1.52	------	------	------	------	------	------	1.25	1.11	1.04	1.32
14	1.32	1.07	1.19	1.33	1.49	1.68	------	1.34	1.22	1.12	0.79
23	1.60	------	------	------	------	------	------	0.98	0.88	0.79	2.16
26	0.81	------	------	1.06	1.30	------	------	------	------	------	1.45
28	3.15	------	------	0.93	1.25	------	1.16	------	------	------	3.81
29	4.37	------	------	------	1.34	------	------	------	------	------	3.99
31	2.49	------	1.00	1.11	------	------	------	------	------	------	3.00
Means	------	**0.94**	**1.08**	**1.16**	**1.34**	(1.58)	(1.16)	**1.19**	**1.08**	**0.98**	------
Departures	------	**+0.01**	**+0.04**	**−0.01**	**−0.03**	------	−0.11	**+0.03**	**+0.04**	**+0.06**	------

* Extrapolated.

Table 2 shows a deficiency in the total solar radiation received on a horizontal surface from the sun and sky at the three stations for which normals have been determined.

No skylight polarization observations were obtained at Madison, Wis., as the ground was covered with snow throughout the month. At Washington, measurements made on three days give a mean of 63 per cent with a maximum of 65 per cent on the 12th. These are slightly above the corresponding averages for January at Washington.

TABLE 2.—*Solar and sky radiation received on a horizontal surface*

[Gram-calories per square centimeter of horizontal surface]

Week beginning—	Average daily radiation						Average daily departure from normal		
	Washington	Madison	Lincoln	Chicago	New York	Twin Falls	Washington	Madison	Lincoln
	Cal.	*Cal.*	*Cal.*	*Cal.*	*Cal.*	*Cal.*	*Cal.*	*Cal.*	*Cal.*
Jan. 1	128	129	179	56	122	182	−22	−8	−4
8	146	123	224	50	126	168	−9	−27	+28
15	124	128	149	75	73	316	−37	−36	−55
22	150	194	178	92	128	199	−30	+7	−42
Deficiency since first of year on Jan. 28							−686	−448	−511

PHOTOHELIOGRAPHIC OBSERVATIONS, 1927

Beginning with this issue of the REVIEW we plan to publish each month data similar to that given in the table below. This is the outgrowth of a request by the U. S. Naval Observatory that the Weather Bureau aid in expediting the publication of such data obtained by the observatory. The original suggestion has, at the instance of the Weather Bureau, been extended so that data from several widely scattered points will be included, thereby assuring that we shall obtain observations for as many days as possible each month, regardless of sky conditions at any one station. The following observatories are cooperating: U. S. Naval, Yerkes, Mount Wilson, and Harvard College. The Naval Observatory has undertaken to compile the data.

We expect to print in our February issue, in connection with the table, notes describing the methods of photographing the sun spots and of computing their areas.

Positions and areas of sun spots

[Communicated by Capt. Edwin T. Pollock, superintendent U. S. Naval Observatory]

Data from Naval Observatory and Harvard and Yerkes Observatories [1]

Date	Eastern standard civil time	Heliographic		Area [2]	
		Longitude	Latitude	Spot	Group
1927	*Hr. min.*	°	°		
Jan. 2 (N. O.)	11 48	−88.0	−12.0	------	309
		−53.5	+20.0	62	------
		−17.0	+10.0	62	------
		−8.0	+10.5	------	247
		+20.5	−8.0	------	401
Jan. 3 (H.)	11 55	−66	−12	149	------
		−57	−10	------	278
		−37	+20	41	------
		+6	+11	------	159
		+28	−5	834	------
		+50	−18	21	------

[1] The letters N. O. in the first column signify that the photograph was taken at the U. S. Naval Observatory; the letters Y. and H. that it was taken at Yerkes Observatory and Harvard Observatory respectively.

[2] The areas are expressed in millionths of the sun's visible hemisphere. The longitudes east of the central meridian are written as minus, and west of it as plus. The north latitudes are plus and the south minus.

Positions and areas of sun spots—Continued

Date	Eastern standard civil time	Heliographic Longitude	Heliographic Latitude	Area Spot	Area Group
	Hr. min.	°	°		
Jan. 4 (N. O.)	11 34	−57.5	−14.0		278
		−49.0	−12.0	432	
		−28.0	+20.0	62	
		+11.0	+10.5		31
		+19.5	+10.5		340
		+47.5	−8.0	340	
Jan. 5 (N. O.)	11 43	−68.5	−16.0		185
		−47.0	−14.0		123
		−43.0	−17.5		93
		−37.0	−13.5		401
		−14.0	+19.5	62	
		+33.0	+9.5		216
		+62.0	−8.5	340	
Jan. 6 (N. O.)	11 45	−68.0	+7.5	31	
		−57.0	−17.0		309
		−32.0	−12.5		123
		−28.5	−17.5		123
		−22.0	−13.0		432
		−1.0	+19.5	31	
		+1.0	−26.0		31
		+36.0	+6.0	9	
		+47.5	+9.5		123
		+74.0	−8.5	370	
Jan. 7 (N. O.)	11 46	−57.5	+7.0	93	
		−52.0	+7.5	93	
		−48.0	−17.5		93
		−41.5	−16.0		247
		−18.5	−13.0		62
		−16.0	−16.5		123
		−8.5	−13.0		370
		+12.0	+19.5	31	
		+15.0	−25.0		154
		+59.5	+10.5		185
Jan. 8 (N. O.)	11 46	−59.0	−17.5	93	
		−41.0	+8.0		123
		−30.0	−16.0		247
		−3.0	−15.0		216
		+4.5	−12.5		370
		+24.5	+19.5	31	
		+28.0	−25.0		93
		+43.0	−13.0		62
		+75.0	+10.0		185
Jan. 9 (N. O.)	11 55	−47.0	−17.5	31	
		−26.5	+8.0		216
		−17.5	−16.5		370
		+11.0	−15.5		216
		+18.5	−13.0		340
		+38.5	+19.0	31	
		+42.0	−25.5		93
		+57.5	−13.0		62
Jan. 10 (N. O.)	11 45	−13.5	+8.0		432
		−4.0	−17.0		494
		+23.0	−14.0		340
		+31.0	−13.5	309	
		+50.5	+19.0	62	
		+57.5	−26.0	62	
		+72.5	−12.5	31	
Jan. 11 (N. O.)	11 47	+1.0	+8.0		525
		+8.0	−16.5		370
		+37.5	−13.5		309
		+45.0	−13.5	309	
		+64.0	+19.5	62	
		+72.5	−25.0	31	
Jan. 12 (N. O.)	11 47	−16.5	+17.0	19	
		+15.5	+8.0		370
		+17.5	+14.0		62
		+22.5	−17.5		309
		+52.0	−14.5		309
		+59.0	−14.0		401
Jan. 15 (N. O.)	11 57	−85.0	+33.5	247	
		−78.5	−14.5		494
		−47.5	+26.0	648	
		+58.0	+8.0		62
		+64.5	−15.0		93
Jan. 16 (N. O.)	11 49	−65.0	+33.5	278	
		−72.0	−15.0		309
		−61.5	−13.5	309	
		−36.0	+25.0		802
		+14.0	+27.0		154
		+80.0	−15.0		185
Jan. 17 (N. O.)	13 10	−57.5	−15.0		247
		−48.0	+33.5	278	
		−47.0	−13.5	340	
		−18.0	+13.5		123
		−22.0	+26.0		741
		+25.5	+27.5		93
Jan. 18 (H.)	11 5	−42	−14		145
		−33	+31		111
		−32	−13		181
		−7	+26		804
		−4	+14		80
Jan. 20 (N. O.)	12 2	−18.0	−16.0		93
		−12.0	+33.5	247	
		−8.0	−13.0		340
		+17.0	+26.0		772
		+24.0	+14.0	31	
Jan. 22 (N. O.)	11 51	−73.0	−5.5		123
		−25.0	−9.5		62
		+8.5	−14.5		93
		+13.0	+33.5		216
		+18.0	−13.5	309	
		+42.0	+26.0		648

Positions and areas of sun spots—Continued

Date	Eastern standard civil time	Heliographic Longitude	Heliographic Latitude	Area Spot	Area Group
	Hr. min.	°	°		
Jan. 24 (H.)	10 20	−42	−4		41
		−3	+13	16	
		+30	−14	37	
		+35	+31		137
		+39	−14		260
		+66	+23	341	
Jan. 25 (N. O.)	11 50	−32.5	−7.5		62
		+49.0	+33.5		247
		+48.0	−14.5		62
		+57.5	−15.0	247	
Jan. 26 (H.)	11 40	−16	−6	32	
		+15	−14	16	
		+58	+31	179	
		+67	−15		116
Jan. 27 (N. O.)	11 55	−80.0	+11.0		154
		−73.5	−17.5	62	
		−5.5	−7.5	46	
		+75.0	+33.0		247
		+85.0	−14.5	278	
Jan. 29 (H.)	15 5	−75	−13	175	
		−69	−24	133	
		−68	−36	93	
		−66	−10	74	
		−54	+15		54
		−48	+13	96	
		−41	−13		163
		−4	−14	15	
		+8	−7		107
		+21	−6	32	
Jan. 30 (Y.)	13 25	−64	−17		93
		−62	−27		123
		−58	−13		62
		−39	+10		31
		−37	−17		15
		−37	−20		15
		−31	−17		185
		+12	−17		62
Jan. 31 (N. O.)	11 45	−74.5	−7.0	62	
		−53.0	−27.5		340
		−48.0	−13.0		340
		−29.0	+11.0		216
		−20.5	−15.0		370
		+22.0	−17.0		401
		+33.0	−9.0		31
		+50.0	−8.0		31

PROVISIONAL SUNSPOT RELATIVE NUMBERS FOR THE SECOND HALF OF 1926[1]

[Reprinted from A. Wolfer, Meteorologische Zeitschrift, October, 1926, and January, 1927]

	July	August	September	October	November	December
1	104	76	45	29		
2	76	62	21	23		
3	74	89	28			52
4	64	101	21			55
5	43	82	39	37		
6	46	79	42	53		
7			43	69	28	
8		50	29	116	31	
9	23	67	28	80?	35	36?
10	23	62	35	86?	50	69
11	28		30	144	38	
12	16	70	33	132	39	
13	7	75	37	151	40	
14	11	55	55	133	39	80
15	13	47	74	112	38	
16	8	45	73	116	39	92
17	10	40	89	83	37	
18	0	40	112	62	26	
19	14	51	111	55	21	83
20	22	53	106	31	53	68
21	41	74	105			78
22	49	58	89			103
23	55	64	85		113	68
24	99	78	68?	38?	105	
25		73	70	62		
26	125	62		93	110	
27		55	101	85	88	52
28	115	55	80		89	82
29		55	57	50?	64	
30	91	49	49	61	73	29?
31	100	43		42		49
Means	48.3	62.4	60.5	77.7	55.0	66.4

[1] For values for the six months, January to June, 1926, see MONTHLY WEATHER REVIEW, October, 1926, 54; 300.